

Watch Words

Keeping Time

A timepiece bearing the designation “chronometer” is not just any old watch—it has to pass a number of strict tests to prove its accuracy. We visited the luxury watch company Chronoswiss to discover the secret behind such near-perfect precision.

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The scene has something unreal about it: A young woman in a snow-white lab coat is hunched over a small, round disc of metal and, looking through a magnifying glass attached to her glasses, turns tiny screws into it that are hardly bigger than a speck of ground pepper. The “screwdriver” she is using resembles a piece of uncooked spaghetti. Then she takes a lump of modeling clay the size of a hazelnut and uses it to lift microscopic particles off the metal disc. Her fingertips are covered in ultra-thin latex sheaths. She takes painstaking care that not even the tiniest bead of sweat or speck of dust adheres to the mysterious object. A complicated surgical procedure, perhaps? Guess again. The delicate operation we are witnessing is nothing other than the manufacture of a chronometer by the Munich-based company Chronoswiss. This particular chronometer boasts a gold case and a mechanical movement, and retails for €6300, and the word “watch” hardly does it justice.

The chronometer takes its name from the Greek god of time, Chronos, and literally means “time-measurer.” Any watch that aspires to this designation must comply with the strict standards of reliability and accuracy set by the official testing organization of the Swiss watch industry, *Contrôle Officiel Suisse des Chronomètres* (COSC). Over a period of fifteen days, the watch is submitted to a series of rigorous tests. It is placed in various different positions and only passes muster if it doesn’t run more than five seconds slow or fast per day. In addition, a chronometer has to be able to withstand a drop in temperature from twenty degrees to four degrees Celsius (68 to 39 degrees Fahrenheit) and subsequent heating to thirty-six degrees (97 degrees Fahrenheit) without deviating from the narrow range of tolerance. Only if it passes all the tests does it receive the official certification as a chronometer, the *Bulletin de Marche*.

The history of the chronometer goes back 250 years, to the days when Britannia ruled the waves. In 1759, John Harrison, an Englishman and carpenter by trade, developed a “pocket-sized” chronometer based on the mechanism that had long been used in larger “grandfather” clocks. No bigger than an apple, it was so accurate that it was only five seconds slow after a sea voyage of eighty-one days. This miracle of precision won Harrison a prize

A delicate operation: A magnifying glass is required to assemble the tiny movement of a chronometer



of £20,000 that the British government had promised to anyone who came up with a means of precisely determining longitude at sea. That was a very handsome reward in those days, but then the invention had great practical value for the naval superpower: The more precise the clock on board, the more accurately a ship’s position could be determined with the help of a sextant and nautical charts. When Captain William Bligh sailed his ship 3600 miles through the Pacific to Timor after the infamous mutiny on the *Bounty* in 1789, he used a chronometer modeled on the one Harrison had invented.

Just as the chronometer still has its place in this age of electronic timekeeping, so does the “chronograph.” The first chronographs were stopwatches incorporating a tiny stamp that deposited a dot of ink on a sheet of paper, but today the term (derived from the Greek word for “to write,” *graphein*, it literally means “time-writer”) refers to any sports watch that includes a stopwatch function. Though no special certificate is required for a watch to bear that designation, precision chronographs are status symbols highly prized by watch connoisseurs.

Watchmakers soon learned to incorporate the accuracy of chronographs and chronometers in timepieces small enough to wear on a wrist. The center of this precision craft was in Switzerland’s Jurassic mountains, where the best watch movements are made, even to this day. The region’s manufacturers supply the world’s finest watch companies with highly complex movements consisting of hundreds of tiny gears, screws, and springs. Then the various parts such as the case, movement, dial, hands, and push button are assembled into finished watches in workshops such as that of Chronoswiss in Munich. As we watch the young woman in the white coat fitting the tiny pieces together, fascinated by her intense concentration and nimble fingers, Chronoswiss founder and owner Gerd-Rüdiger Lang muses, “A watch is the most precise mechanism in the world. But it will never be able to explain the phenomenon of time itself.”

While it may be impossible to describe time itself, it *is* possible to describe the process of “keeping time.” The regulating organ of a mechanical watch movement, its “engine,” is the balance ▶

Supreme precision: The sum is greater than the hundreds of parts that go into making a chronometer

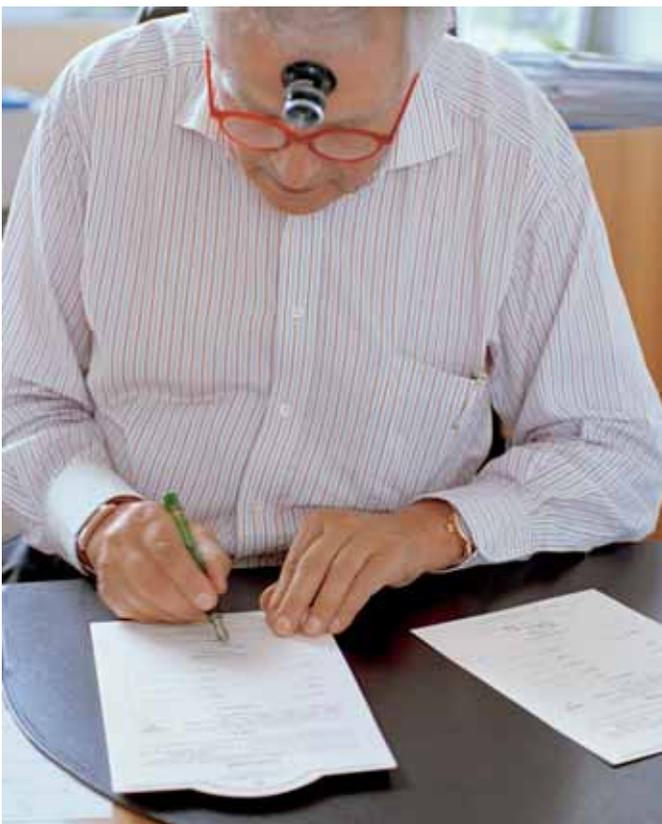


wheel, which vibrates on a spiral hairspring. Lengthening or shortening the balance-spring makes the balance wheel go faster or slower to advance or retard the watch. In modern wristwatches, this mechanism performs up to 36,000 alternations per hour. It might be difficult to imagine, but just to give you an idea: The speed of a balance vibrating at a frequency of 28,800 times an hour corresponds to that of a car going 140 km/h (87 mph).

To ensure their longevity, top-quality watches are made with only the best materials: finest steel for the movement, gold or silver for the case, beryllium alloys for the springs. Since each metal has a specific coefficient of expansion, meticulous setting of the various coefficients at different temperatures and positions to produce finely calibrated interaction is crucial to achieving precision. No easy task—after all, a chronometer contains up to 400 individual metal components.

Such wearable wonders of technology—as painstakingly choreographed as any ballet—enjoy increasing popularity with those who appreciate the aesthetic qualities of classic workmanship. Indeed, many enthusiasts find it hard to stop at one and become avid collectors. Gerd-Rüdiger Lang, for example, is the proud owner of over 1000 wristwatches. Towards the end of our visit, Lang's mood turns philosophical again and he says, "All watches tell time, but wouldn't it be great if they could also tell us what to do with our time?" I guess that's one thing even the best watch can't do—at least not yet. ◀

Only the best need apply: Chronoswiss owner Gerd-Rüdiger Lang signs the certificate for one of his company's precision chronographs



A Short Glossary of Timekeeping Terms

Automatic Movement

An automatic movement requires no winding because of the rotor, which winds the mainspring every time you move your hand.

Bearings

Drilled holes for the gears of the movement.

Caliber

Technical term for the dimensions of the watch; the diameter of the movement is specified in "lines" (one line is equivalent to 2.256 mm). It is used to describe the size and configuration of the movement, and can now indicate the shape, origin and designer as well.

Chronograph

A multifunction sports watch with a stopwatch function. Most have two or three subdials for minutes and hours. This designation is not based on a strict test, as is the case with chronometers.

Chronometer

A precision watch tested at various temperatures and positions, to meet the accuracy standards of the official Swiss watch institute COSC.

Jewels

Synthetic sapphires or rubies used to reduce friction in the gear bearings. A quality hand-wound or automatic watch contains at least 17 jewels.

Manual

A watch that must be wound by hand once a day by turning the crown.

Mechanical Watch

A watch with movement based on mechanical oscillation (as opposed to quartz movement, based on the vibrations of a tiny crystal).

